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ABSTRACT

To study the effects of motivation on cognition, 55 fifth- and sixth-grade students were randomly assigned to 3 motivational treatment groups: (1) ego-involved (ability oriented); (2) task-involved (mastery oriented); and (3) control (no orientation). The ego-involvement treatment attempted to make subjects feel that their abilities on the tasks were being judged and compared to those of other subjects. The task-involvement treatment encouraged subjects to view any mistakes as challenges and to see the overcoming of these challenges as the end goal. The control treatment offered the subjects no interpretation of the tasks, leaving the subjects free to generate their own orientation toward the tasks. All subjects completed a computer task that required them to process 60 words at one "shallow" and two "deep" levels of processing through rhyming (shallow), categorization (deep), and sentence completion (deep). No differences existed between the treatment groups at the rhyming level of processing, but at the categorization and sentence-completion levels, the task-involved and control treatment groups recalled significantly more words than did the ego-involved group. This finding suggests that ego-involvement may be especially detrimental to learning that requires deeper levels of cognitive processing. Appendix A provides a transcript of experimental procedures, Appendix B lists the levels of processing of task items, and Appendix C includes the follow-up questions and the 60-item free recall measure used in the study. (SLD)

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Motivation and Cognition: The Impact of Ego and Task-Involvement on Levels of Processing

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Abstract

To study the effects of motivation on cognition, 55 fifth and sixth grade students were randomly assigned to three motivational treatment groups: ego-involved (ability oriented), task-involved (mastery oriented), and control (no orientation). All subjects completed a computer task that required them to process 60 words at one "shallow" and two "deep" levels of processing: rhyming (shallow), categorization (deep), and sentence completion (deep). No differences existed between the treatment groups at the rhyming level of processing, but at the categorization and sentence completion levels, the task-involved and control treatment groups recalled significantly more words than the ego-involved group. This finding suggests that ego-involvement may be especially detrimental to learning that requires deeper levels of cognitive processing.

It is popularly believed that people who are motivated learn better. This statement links two areas of educational and psychological research: motivation and cognition. But the exact relationship between motivation--a student's inclination to learn as influenced by anxiety, rewards, and interest among other factors--and cognition--a student's processing, storing, and retrieving of information--remains largely unexplored. To explore this relationship, this study examined how motivation, as produced by different instructional methods, affects cognition. In particular, this study tried to determine if students who learn because they feel their competence is being judged through tests or observations process information differently than students who learn for the sake of learning.

To better understand the relationship between motivation and cognition, I carried out a study in which I varied both the cognitive level of processing and the motivational orientation of the subjects. The design of this study was strongly influenced by Craik and Lockhart's levels of processing model (1972) and Nicholls (1984) analysis of ego and task-involvement effects on learning.

Craik and Lockhart's well known model of levels of processing (1972) holds that memory performance is a positive function of the level of processing required by an orienting task. In other words, how well someone remembers something depends on what kind of analysis the person is required to do when first exposed to the information. Followers of this model, have found evidence which argues that orienting tasks which

require "shallow" levels of processing (those that require less analyzing, such as estimating number of letters in a sentence and rhyme recognition) lead to significantly lower memory performance than tasks that involve "deep" levels of processing (such as evaluation of familiarity, taxanomic categorization, and fit in a sentence) (Rosenberg & Schiller, 1971; Moscovitch and Craik, 1976).

Nicholls (1984) in his research found higher performance and subjective experience in experimental achievement settings for subjects who experienced task-involving rather than ego-involving motivational states. Task-involving conditions are those that promote the subject's perception that mastery is the result of effort and that improvement in skill level is the end goal. In an ego-involving condition subjects are faced with tasks that they perceive as the basis for an evaluation of their competence, intelligence, or ability (Nicholls, 1984). Besides Nicholls, other reseachers have also found potential hazards of environments which promote ego-involvement. The hazards they cite include: increases in extrinsic motivation, decreases in intrinsic motivation, undermining of creativity, lowered conceptual learning, and accelerated memory loss (Lepper & Greene, 1975; Grolnick & Ryan, 1987).

In this study I have set out to confirm Nicholls' findings concerning task- and ego-involving motivational conditions and Craik and Lockhart's findings regarding varying levels of cognitive processing. Moreover, I have attempted to show that an interaction exists between motivational conditions and levels

of processing. I have also tried to identify affects which may play a mediating role between ego- and task-involvement and the learning process. Lastly, I have made an effort to determine whether ego & task involvement produce their changes in the cognitive process during encoding or retrieval.

In light of past research, I expected to find the following: 1) Overall, those subjects in the task-involved group would recall more words than those in the ego-involved group; 2) Overall, items that required deep levels of processing (categorization and sentence completion) would be remembered better by all subjects than shallow level items (rhyming); 3) The ego-involvement treatment would be more detrimental to recall performance at the deep levels of cognitive processing (categorization and sentence completion) than the shallow level (rhyming); and 4) The ego-involved subjects would report having felt more nervous, more difficulty, less enjoyment, less effort, and less interest during the learning task than the task-involved and control subjects.

Finally, I conducted this study because I believed that it could provide useful insights concerning how teachers can motivate students in a manner that will promote deeper levels of processing and therefore better learning.

Subjects

During the month of April 1989, 55 fifth and sixth grade students were randomly assigned to the three treatments in this study. All the students belonged to the same team of teachers in a University Research elementary school. Among the students were

24 boys and 31 girls ranging in age from nine years and eleven months to twelve years and nine months. The mean age was eleven years and six months for the boys (M=11.5) and eleven years and two months for the girls (M=11.17). The subject population had a good representation of racial minorities due to the school's effort to maintain a student population reflective of the nation's racial demographics. The subjects also ranged in academic ability and this factor was taken into account during analysis. All the subjects were proficient in English, a necessary skill for the cognitive tasks used in the study.

Experimental Design

This study includes both between- and within-subject factors. The between-subject factor was type of motivational treatment received by the subject: ego-involvement, task-involvement, or control. The ego-involvement treatment attempted to make the subjects feel that their abilities at the tasks they were performing were being judged and compared to that of other subjects. The task-involvement treatment encouraged subjects to view any mistakes they made as challenges and the overcoming of those mistakes was the end goal. The control treatment offered no interpretation of the tasks to the subjects, leaving the subjects free to generate their own orientation toward the tasks. The within-subject factor of the design was the level of processing which the words to be recalled required: rhyming, categorization, and sentence completion. None of the subjects were aware that their recall of the computer task items would be

tested. This allowed for the measurement of unintentional learning.

Before the study began, the class list was obtained and all the subjects were randomly assigned to one of the three conditions. Subjects were run individually. The total time a subject spent with the researcher ranged from 30 to 40 minutes.

As soon as subjects were taken out of the classroom, they were told what types of activities they would be doing and that they did not have to do anything that they did not want to do. Next, the subjects attempted two puzzles that were pre-tested to likely lead to failure given the time alloted to solve them. After completing each puzzle, the subjects in each of the three treatment groups--task, ego, and control--received a different researcher explanation for the puzzle failure, and a different researcher expectation for the upcoming computer task.

> Ego: Now, we're ready for the next task. From how you did on these puzzles I have a pretty good idea of how you will do on the next activity.
>
> Task: Now, we're ready for the next task. Many people make mistakes on these puzzles in the beginning but get better as they go along. When people see the puzzles as a challenge, it makes them try harder and have more fun along the way. The next activity is a lot like this one, in that you will probably get better as you go along.
>
> Control: Now, we're ready for the next task.

During the computer task, the subjects answered "yes" or "no" to 6 warm-up and 60 official questions that directed the students level of processing. Immediately after completing the computer task, the subjects reported their level of enjoyment, nervousness, effort, interest, and task ease felt during the

computer task. This time also served to clear short term memory. Once the affect questionnaire was completed, each treatment group received a different researcher expectation for the upcoming free recall measure.

> Ego: Now I think I have a pretty good idea of how your performance on this activity compares to other students your age. It seems that people are either good at these activities or they are not.
>
> Task: I hope you learned some new things doing that activity. I think I saw you getting better as the activity went on.
>
> Control: We are now finished with using the computer.

All the subjects were given five minutes to complete the free recall measure. After which, the subjects were given 10 minutes to complete the cued recall measure. After all the measures were filled out, the number of recall responses made were counted and all the subjects were told that they had performed very well on all the tasks. A more detailed transcript of the experimental procedure can be found in Appendix A.

Experimental Tasks

One set of experimental tasks used were comercially published puzzles that require the subject to construct geometric forms from seven puzzle pieces (five different-sized triangles, a square, and a rhomboid). Each form to be constructed was depicted on a seven by eleven inch card with no indication of how the individual pieces fit together. These puzzles were used to set the subjects' expectations for their future performance on the computer-cognitive task.

To direct the subjects to process words at different levels of analysis, the following task was developed based on a prior task used by Moscovitch and Craik (1976). The task was programed into a MacIntosh computer using the program Hypercard. First subjects saw a question appear on the screen for six seconds. Next they saw a highlighted word to which the question refered. Finally, the subject had to enter the response "yes" or "no" . Of the total 60 questions, 20 required phonemic analysis (rhyme), 20 required taxanomic analysis (category), and 20 required semantic analysis (sentence). The latter two types of questions are presumed to involve deeper levels of processing. The entire set of questions took about eight minutes for students to complete. The vocabulary used for both the questions and stimulus words was selected from vocabulary lists for kindergarten through fourth grade students (EDL Reading Core Vocabulary).

Six example items for this task are given here. The first two require rhyming (phonemic processing), the third and fourth involve category discrimination (taxonomic processing), and the final two require a determination of sentence coherence (semantic processing).

<u>Rhyme</u>
1) Does it rhyme with the word 'hip'? (trip)
2) Does it rhyme with the word 'hike'? (hush)

<u>Category</u>
3) Is it a kind of plant? (fern)
4) Is this something you wear? (pudding)

Sentence

5) Does it fit in the sentence:
The _____ flew to the lamp. (moth)
6) Does it fit in the sentence:
He hit the _____ in the mouth. (broom)

Additional items used in this task are located in Appendix B.

To protect against arguments that it is the stimulus words and not the questions that influence memory performance, the stimulus words were rotated among the three levels of processing from subject to subect (forms A, B, and C).

Dependent Measures

Three measures were used in this study. The first measure was a set of questions and rating scales that checked for the effect of the motivational treatment and gathered knowledge about the subject's affective state. The questions were concerned with what degree the subject felt enjoyment, was interested, felt nervous, exerted effort, and experienced the task to get easier during the cognitive task. For example, to respond to the question, "Was the game enjoyable?", subjects circled the number closest to how they felt based on the anchors one is equal to "Yes", four is equal to "Some", and seven is equal to "No". This measure also served to clear the subject's short term memory before beginning the recall measures.

Two surprise recall measures were given to all subjects. None of the subjects knew in advance that they would have to recall the items from the computer task. One recall measure was a five minute free recall measure. Subjects were given a blank piece of paper with 60 slots and asked to remember as many of the highlighted words from the computer as they could. The second

measure was a cued-recall measure. Subjects were asked to write in the words they remember being associated with the questions listed on the sheet next to each question. Subjects were given ten minutes to complete the cued-recall measure. All three measures can be found in Appendix C.

The purpose of having the cued-recall measure was to see if having retrieval cues as compared to no cues (free recall) would reduce or increase any differences found between motivational treatment groups. These findings may provide some evidence for the hypothesis that ego-involvement is more detrimental at the stage of encoding than retrieval. The logic behind this argument is that retrieval cues can only help access those words that were encoded. The cues cannot be of any help for those words that were never encoded in the memory. Therefore, lack of performance when retrieval cues are present suggests lack of encoding.

Preliminary Results

To rule out the possibility of differences on the cued recall measure due to gender, a MANOVA was calculated. No significant differences were found. Further, to rule out the possibility that it was the stimulus words and not the questions (level of processing orientation) that caused the differences between the three treatment groups, a MANOVA between the three forms used (Form A, B, and C) and the number of words recalled at each level on the cued recall test was run. Again, no significant differences were found between the three forms.

Results

Below in Table 1 and Table 2 the means and standard deviations are listed for both the free and cued recall measures. It is evident that all subjects were able to recall more words on the cued recall measure, but the increase was limited by both treatment group and level of processing. Specifically, the increase in the number of rhyme words was significantly lower than category or sentence words for all subjects [$F(2,104) = 87.29$, $p < .001$]. Further, the gain in category and sentence scores for the task-involved and control groups were significantly greater than the gain for the ego-involved group [$F(2,52) = 6.37$, $p < .005$]. All F statistics reported in this study were calculated with a 3x3 Repeated Measures Multiple ANOVA.

Table 1: Means and Stadard Deviations for Free Recall Measures

	Rhyme	Category	Sentence	Total
Range	0-4	0-8	0-7	2-15
Ego n=20	1.4 (1.0)	2.8 (1.9)	2.45 (1.7)	6.65 (3.1)
Task n=19	.895 (.94)	2.95 (1.5)	3.47 (1.8)	7.32 (3.0)
Control n=16	1.06 (1.1)	2.81 (1.2)	2.50 (1.0)	6.38 (2.3)
All n=55	1.13 (1.0)	2.86 (1.6)	2.82 (1.6)	6.8 (2.8)

Table 2: Means and Standard Deviations for Cued Recall Measures

	Rhyme	Category	Sentence	Total
Range	0-7	0-13	0-13	4-28
Ego	1.95	6.75	7.0	15.7
n=20	(1.4)	(3.0)	(3.1)	(5.6)
Task	1.90	9.05	9.58	20.5
n=19	(1.5)	(2.9)	(2.2)	(5.0)
Control	2.19	8.44	8.81	19.44
n=16	(1.8)	(1.7)	(2.0)	(3.1)
All	2.0	8.04	8.42	18.46
n=55	(1.5)	(2.8)	(2.7)	(5.1)

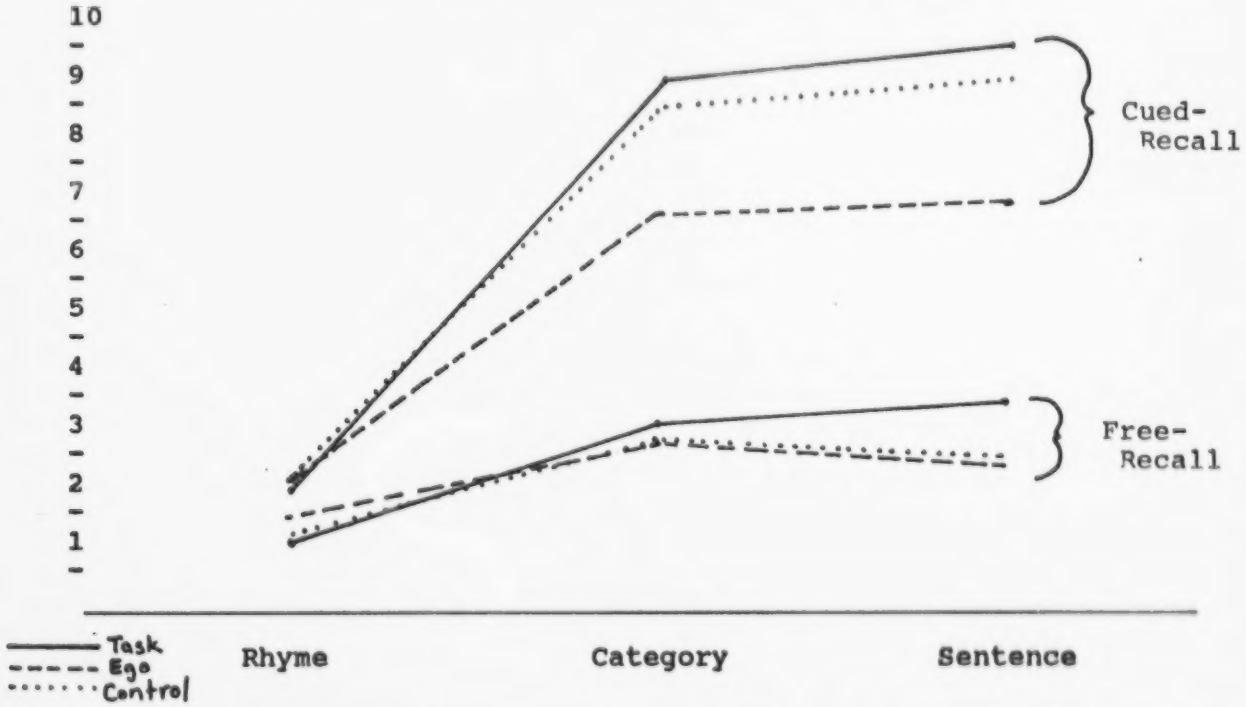
There were no significant differences found between the three treatment groups on the number of words they were able to list on the free recall measure. However, words processed at the rhyme level were recalled a significantly less than words processed at the category and sentence level for all subjects [$F(2, 104) = 32.13$, $p < .001$].

Unlike on the free recall measure, significant differences between treatment groups were found on the cued recall measure. First, the subjects in the task-involving and control treatment groups performed significantly higher across all levels of processing than subjects in the ego-involving treatment [$F(2, 52) = 5.52$, $p < .01$]. Second, all subjects recalled fewer rhyming words than category and sentence words [$F(2, 104) = 172.5$, $p < .001$]. Finally, an interaction was found between the treatment groups and levels of processing [$F(4, 104) = 2.51$, $p < .05$]. This interaction is illustrated in Graph 1.

To determine where the performance differences on the cued recall measure exist between the three treatment groups, post-hoc

t-tests were conducted. The results were that no significant differences existed between the groups at the rhyme level of processing, but there were significant differences at the category and sentence levels. Both the task-involving and control treatment groups recalled significantly more of the category and sentence items than the ego-involving group [$p < .05$]. Yet, no significant differences were found between the task-involving and control groups.

Graph 1: Free and Cued Recall By Treatment



To insure that the differences found between the treatment groups on the cued recall measure were not due to achievement differences between the subjects assigned to each of the groups, an ANOVA was run with achievement as a covariate. The results were that significant differences still existed between the ego-

involved group and the other two treatments [F (2,51) = 4.58, p < .05].

The means and standard deviations of the self-reported affects are listed in Table 3. The lower the number, the more the subjects felt the affect listed during the levels of processing task on the computer.

Table 3: Means and Standard Deviations of Affects by Treatments
Range = 1 to 7

	Ego	Task	Control
Enjoyment	3.8 (1.9)	3.4 (1.2)	2.9 (1.3)
Interest	3.8 (2.2)	3.4 (1.8)	3.3 (1.9)
Nervousness	5.5 (2.0)	5.6 (1.7)	5.8 (1.5)
Effort	2.7 (2.0)	2.6 (1.6)	3.4 (2.5)
Ease	3.2 (1.8)	2.2 (2.0)	3.5 (1.6)
Other Enjoy	4.2 (2.2)	3.8 (1.7)	3.5 (1.3)

There were no significant differences in the degree of affects reported between the three treatment groups. Although the results were not significant, the task-involved group consistently reported higher degrees of positive affects (enjoyment, interest, effort, and ease) and lower degrees of negative affects (nervousness) than the ego-involved group.

Discussion

As predicted by Nicholls' (1984) research, the overall performance of subjects in the task-involved treatment group was higher than the performance of those subjects in the ego-involved

group. Furthermore, the control group also performed significantly higher than the ego-involved group. This finding suggests that task involvement may be the natural state of learners, and it is only when we make learners feel self-concious about their abilities, by observing or testing them with the intentions of comparing their performance to others, that they become ego-involved. This study also supported Moscovitch and Craik's (1976) past research by finding that subjects in all the motivational treatment groups recalled more deep level processing words (categorization and sentence completion) than shallow level rhyming) words.

Besides confirming past research, this study revealed an interaction between motivational states and the cognitive processes. Being ego-involved was more detrimental to a subject's ability to recall words at deep levels of processing (categorization and sentence completion) than at a shallow level (rhyming). The most important finding in this study is that motivational states appear to have more influence on a person's ability to learn at deeper levels of processing. This finding suggests that beyond educational tasks such as rote memorization or letter decoding, a student's motivational state can influence how well that student can learn. For the classroom, this finding implies that educators need to minimize students concerns over their performance relative to others and maximize students' attention and efforts toward task mastery. Unfortunately, students are constantly made aware of their relative performance through standardized testing, grading curves, teacher comments,

public achievement displays, and class rankings. As educators, it is important to recognize the potential hazards of these tools of comparison and to consider alternatives such as criterion tests used in a mastery learning approach.

The prediction that the ego-involved subjects would report more negative and less positive affects was not supported by the study's data. Since there was a trend in the direction of the prediction, the lack of results may have been due to either the treatment or the measures being too weak. It is important to remember, that this study was a brief treatment, lasting only 30 to 40 minutes. In real life, students' abilities are measured and compared on a daily basis. The affects that result from this more intense classroom experience are therefore probably much stronger. A study that examines the differences in affects experienced in classrooms that engage in a great deal of ability comparison and classrooms that refrain from such comparisons and instead focus on task mastery might have more successful results.

Since the task-involved subjects were able to benefit significantly more from retrieval cues than the ego-involved subjects, it is likely that the interference in memory performance suffered by the ego-involved group occured during the encoding rather than the retrieval stage of cognition. This finding is important because it suggests that ego-involvement blocks encoding--the essential first step to learning. The finding does not support the notion that the information has entered memory but is inaccessible due to anxiety. In other words, ego-involvement prevents learning from taking place. It

is possible that ego-involvement directs people's cognitive strategies to lower level processing (i.e., rote memorization) that result in less learning, while task-involvement encourages more complex cognitive strategies (i.e., creating associations, taxanomies, and hierachies) that lead to greater learning. Again, this hypothesis requires further study.

In conclusion, this study found that students who learn for the sake of learning process information differently and learn better than students who learn because they feel their competence is being judged through tests or observations. The implications of this study are clear for both research and the classroom. For research, there is a need for additional studies that examine how motivational states like ego and task-involvement direct a person's cognitive strategies and affect his or her ability to process information. For the classroom, it is important for teachers and administrators to recognize the potential hazards of focusing students' attention on their relative abilities and to learn about the benefits of directing students' attention towards task mastery.

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APPENDIX A: TRANSCRIPT OF EXPERIMENTAL PROCEDURES

Transcript of Experimental Procedures

All subjects were informed that they were doing some activities that would help me, the researcher, in the making of a game to be used in schools. They were also informed that if, at anytime, they did not wish to not participate in the activities I asked them to do, they should let me know and I would take them back to their class. Next, they were informed that they would be doing two types of activities-- puzzzles and something on the computer. Further, they were told that although these activities don't seem related, we have found that how students do on the puzzles tells us how you will probably do on the computer. (The word "how" was left ambiguous to mean either learning strategies or actual achievement.) Next, all subjects were told the following.

> All: For the puzzles you are going to work on there will be a time limit. You have one minute to solve each puzzle. That's the right amount of time for kids your age. If you solve the puzzle within that time, you get it right. If you don't solve it before one minute is up, you won't get it right. When I say "begin," start the first puzzle and keep working on it either until you solve it or until I tell you to stop. Any questions? O.K., begin.

Following completion of the two puzzles, subjects who were in the different motivational treatments received different feedback.

> Ego: Now, we're ready for the next task. From how you did on these puzzles I have a pretty good idea of how you will do on the next activity.
>
> Task: Now, we're ready for the next task. Many people make mistakes on these puzzles in the beginning but get better as they go along. When people see the puzzles as a challenge, it makes them try harder and have more fun along the way. The next activity is a lot like this one, in that you will probably get better as you go along.
>
> Control: Now, we're ready for the next task.

Next subjects wereinstructed how the next activity on the computer works.

> All: First you will see a question appear on the screen. I will read it aloud. Next, you will see a highlighted word appear. I will read it aloud. Press the key marked 'yes' or 'no' as your answer to the question. After this, another question will appear. We will do this for about six minutes. But, before we start let's try a few warm-up questions on the computer.... Any questions? If not, let's start.

After completing the computer task, each motivational treatment group received a second dose its treatment.

> Ego: Now I think I have a pretty good idea of how your performance on this activity compares to other students your age. It seems that people are either good at these activities or they are not.
>
> Task: I hope you learned some new things doing that activity. I think I saw you getting better as the activity went on.
>
> Control: We are now finished with using the computer.

Next, all the subjects were given the follow-up questions about how they felt during the computer task. I made sure to move away from the desk when they answered all the measures to avoid making them feel I was judging their answers.

> All: I would like you to now answer a few questions about what you thought of the game. After each question, circle the number that is closest to how you feel. It is important that you know there are no right or wrong answers for these questions.

After finishing the follow-up questions, all subjects were instructed how to complete the free recall measure.

> All: Now that you have had a few moments to rest, I would like to see how many of the highlighted words you remember from the computer activity. Here is a piece of paper with 60 blanks. Try to write down as many highlighted words as you can remember. Guessing is welcome. I'll give you up to five minutes. Get ready, set, go.

After five minutes, the subjects were instructed how to use the cued recall measure.

> All: Now I want you to try something I think you will find a bit easier. Here is a list of the questions you were asked. Try to use these questions to help you remember the highlighted words. Write down all the words you remember next to each of the questions. You can have up to five minutes to finish this one too. Ready, set, begin.

Finally, the number of words that the student wrote down on both the recall measures were counted and the the students were told the following, emphasizing the students' high achievement.

> All: You did very well on all the activities. Thank you for your help today and for being so patient. I

need to ask you one last favor. Please don't discuss the activities we did today with the other students. When I am finished testing students, I will come to your class and let you all know what we have learned about this game.

APPENDIX B: LEVELS OF PROCESSING TASK ITEMS

Level of Processing Task Items

Warm-ups

1) Does it rhyme with the word 'hip'? (trip)

2) Does it rhyme with the word 'hike'? (hush)

3) Is it a kind of plant? (fern)

4) Is this something you wear? (pudding)

5) Does it fit in the sentence:
The _____ flew to the lamp. (moth)

6) Does it fit in the sentence:
He hit the ____ in the mouth. (broom)

Rhyming Condition

	A	B	C
Affirmative			
1) Does it rhyme with the word 'make'?	lake	rake	cake
2) Does it rhyme with the word 'look'?	crook	brook	hook
3) Does it rhyme with the word 'flea'?	pea	tea	sea
4) Does it rhyme with the word 'pose'?	rose	nose	hose
5) Does it rhyme with the word 'sin'?	gin	fin	bin
6) Does it rhyme with the word 'foe'?	hoe	doe	toe
7) Does it rhyme with the word 'log'?	dog	fog	hog
8) Does it rhyme with the word 'above'?	glove	shove	love
9) Does it rhyme with the word 'nail'?	pail	tail	hail
10) Does it rhyme with the word 'saw'?	claw	law	paw
11) Does it rhyme with the word 'fun'?	sun	bun	gun
12) Does it rhyme with the word 'fine'?	spine	line	wine
13) Does it rhyme with the word 'role'?	pole	hole	mole
14) Does it rhyme with the word 'mat'?	gnat	rat	bat
15) Does it rhyme with the word 'tag'?	flag	bag	rag
Negative			
16) Does it rhyme with the word 'grab'?	nut	kite	ball
17) Does it rhyme with the word 'cozy'?	truck	zoo	fire
18) Does it rhyme with the word 'chop'?	farm	doll	goat
19) Does it rhyme with the word 'beat'?	road	wig	horse
20) Does it rhyme with the word 'rim'?	ear	milk	grass

Category Condition

	A	B	C
Affirmative			
1) Is the word something that has water in it?	brook	sea	lake
2) Is the word a kind of garden tool?	rake	hose	hoe
3) Is the word something to eat?	bun	cake	pea
4) Is the word something used when fishing?	line	hook	pole
5) Is the word part of the human body?	nose	toe	spine
6) Is the word a kind of animal?	doe	hog	dog
7) Does the word have something to do with the weather?	fog	hail	sun
8) Is the word something to fill?	hole	bin	pail
9) Is the word a part of a cat?	tail	paw	claw
10) Is the word something to drink?	tea	wine	gin
11) Is the word something the police work with?	law	gun	crook
12) Is the word a kind of pest?	rat	mole	gnat
13) Is the word something that can be made of cloth?	bag	rag	flag
14) Is the word something you could give someone?	shove	love	rose
15) Is the word a piece of sports equipment?	fin	bat	glove
Negative			
16) Is the word part of a camera?	kite	ball	nut
17) Is the word a day of the week?	zoo	fire	truck
18) Is the word a kind of sport?	doll	goat	farm
19) Is the word something that votes?	wig	horse	road
20) Is the word a kind of bird?	milk	grass	ear

Sentence Condition

	A	B	C
Affirmative			
1) Does the word fit in the sentence: We had a picnic by the ____.	sea	lake	brook
2) Does the word fit in the sentence: The ____ is in the shed.	hose	hoe	rake
3) Does the word fit in the sentence: I saw her eat the ____.	cake	pea	bun
4) Does the word fit in the sentence: The fisherman fixed his ____.	hook	pole	line
5) Does the word fit in the sentence: He hurt his ____.	toe	spine	nose
6) Does the word fit in the sentence: The ____ ran away.	hog	dog	doe
7) Does the word fit in the sentence: I looked inside the ____.	bin	pail	hole
8) Does the word fit in the sentence: The animal doctor treated the animal's ____.	paw	claw	tail
9) Does the word fit in the sentence: She spilled the ____.	wine	gin	tea
10) Does the word fit in the sentence: The ____ followed the rain.	hail	sun	fog
11) Does the word fit in the sentence: A ____ can carry a germ that can make you sick.	mole	gnat	rat
12) Does the word fit in the sentence: He thought the ____ would hurt him.	gun	crook	law
13) Does the word fit in the sentence: The old ____ was dirty.	rag	flag	bag
14) Does the word fit in the sentence: She remembered the ____ she got.	love	rose	shove
15) Does the word fit in the sentence: It was my turn to use the ____.	bat	glove	fin

Negative	A	B	C
16) Does the word fit in the sentence: The ____ said he was sick.	ball	nut	kite
17) Does the word fit in the sentence: My ____ gave me a present.	fire	truck	zoo
18) Does the word fit in the sentence: The ____ barked loudly.	goat	farm	doll
19) Does the word fit in the sentence: The ____ owed me money.	horse	road	wig
20) Does the word fit in the sentence: He told the ____ not to enter the room.	grass	ear	milk

APPENDIX C: MEASURES

SELF-REPORT AFFECTS

FREE RECALL

CUED RECALL

Follow-Up Questions

Circle the number that is closest to how you feel.

1) Was the game enjoyable?

YES			SOME			NO
1	2	3	4	5	6	7

2) Would you like to play this game again in the future?

YES			SOME			NO
1	2	3	4	5	6	7

3) Did you feel nervous when playing this game?

YES			SOME			NO
1	2	3	4	5	6	7

4) Do you feel you tried hard to do well at this game?

YES			SOME			NO
1	2	3	4	5	6	7

5) Did the game get easier the longer you played it?

YES			SOME			NO
1	2	3	4	5	6	7

6) Do you think other students would enjoy this game?

YES			SOME			NO
1	2	3	4	5	6	7

Free Recall Measure

Write down as many of the highligted words as you can remember in the blank spaces below. Guesses are welcome.

1) _____	21) _____	41) _____
2) _____	22) _____	42) _____
3) _____	23) _____	43) _____
4) _____	24) _____	44) _____
5) _____	25) _____	45) _____
6) _____	26) _____	46) _____
7) _____	27) _____	47) _____
8) _____	28) _____	48) _____
9) _____	29) _____	49) _____
10) _____	30) _____	50) _____
11) _____	31) _____	51) _____
12) _____	32) _____	52) _____
13) _____	33) _____	53) _____
14) _____	34) _____	54) _____
15) _____	35) _____	55) _____
16) _____	36) _____	56) _____
17) _____	37) _____	57) _____
18) _____	38) _____	58) _____
19) _____	39) _____	59) _____
20) _____	40) _____	60) _____

Group_____ Name _____

Write down as many of the words that followed these questions, next to the questions, as you can. Use them like hints to help you.

1) Does it rhyme with the word 'above'? _____

2) Is the word something that has water in it? _____

3) Does the word fit in the sentence:
I saw her eat the ____. _____

4) Does it rhyme with the word 'fine'? _____

5) Is the word something to fill? _____

6) Does the word fit in the sentence:
I looked inside the ____. _____

7) Does it rhyme with the word 'cozy'? _____

8) Is the word something the police work with? _____

9) Does the word fit in the sentence:
A ____ can carry germs that can make you sick. _____

10) Does it rhyme with the word 'mat'? _____

11) Is the word part of a camera? _____

12) Does the word fit in the sentence:
The old ____ was dirty. _____

13) Does it rhyme with the word 'grab'? _____

14) Is the word a kind of animal? _____

15) Does the word fit in the sentence:
He told the ____ not to come in. _____

16) Does it rhyme with the word 'flea'? _____

17) Is the word a kind of garden tool? _____

18) Does the word fit in the sentence:
The ____ barked loudly. _____

19) Does it rhyme with the word 'saw'? _____

20) Is the word a day of the week? _____

21) Does the word fit in the sentence:
The ____ ran away. _____

22) Does it rhyme with the word 'chop'? _____

23) Is the word something that can be made of cloth? _____

24) Does the word fit in the sentence:
It was my turn to use the ____. _____

25) Does it rhyme with the word 'nail'? _____

26) Is the word something used when fishing? _____

27) Does the word fit in the sentence:
The fisherman fixed his ____. _____

28) Does it rhyme with the word 'make'? _____

29) Is the word something to drink? _____

30) Does the word fit in the sentence:
The ____ owed me money. _____

31) Does it rhyme with the word 'sin'? _____

32) Is the word a kind of sport? _____

33) Does the word fit in the sentence:
We had a picnic by the ____. _____

34) Does it rhyme with the word 'beat'? _____

35) Is the word a kind of pest? _____

36) Does the word fit in the sentence:
The ____ is in the shed. _____

37) Does it rhyme with the word 'role'? _____

38) Does the word have something to do with the weather? _____

39) Does the word fit in the sentence:
The girl remembered the ____
she got. _____

40) Does it rhyme with the word 'look'? _____

41) Is the word part of the human body? _____

42) Does the word fit in the sentence:
He thought the ____ would
hurt him. _____

43) Does it rhyme with the word 'tag'? _____

44) Is the word something that votes? _____

45) Does the word fit in the sentence:
She spilled the ____. _____

46) Does it rhyme with the word 'pose'? _____

47) Is the word something you eat? _____

48) Does the word fit in the sentence:
My ____ gave me a present. _____

49) Does it rhyme with the word 'rim'? _____

50) Is the word part of a cat? _____

51) Does the word fit in the sentence:
The ____ said he was sick. _____

52) Does it rhyme with the word 'fun'? _____

53) Is the word something you could give someone? _____

54) Does the word fit in the sentence:
He hurt his ____. _____

55) Does it rhyme with the word 'log'? _____

56) Is the word a piece of sports equipment? _____

57) Does the word fit in the sentence:
The ____ followed the rain. _____

58) Does it rhyme with the word 'foe'? _____

59) Is the word a kind of bird? _____

60) Does the word fit in the sentence:
The animal doctor treated the
animal's ____. _____